

CLAIM AMENDMENTS

Claim 1 (previously amended): A trench capacitor, comprising:

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a substrate formed with a trench;

said trench having an upper region and a lower region and a conductive trench filling formed of tungsten-containing material disposed in said upper and lower regions of said trench;

an insulation collar formed in said upper region;

a buried well formed in said substrate, said lower region at least partly extending through said buried well; and

a dielectric layer formed of tungsten oxide material lining said lower and upper regions, said dielectric layer serving as a capacitor dielectric.

2 (original): The trench capacitor according to claim 1, wherein said conductive trench filling is a tungsten-containing material.

3 (original): The trench capacitor according to claim 1, wherein said dielectric layer has a dielectric constant greater than 50.

4 (original): The trench capacitor according to claim 1, including a barrier layer disposed between said dielectric layer and said substrate.

5 (original): The trench capacitor according to claim 1, including a barrier layer disposed between said dielectric layer and said conductive trench filling.

6 (original): The trench capacitor according to claim 1, including:

a barrier layer disposed between said dielectric layer and said substrate; and

a further barrier layer disposed between said dielectric layer and said conductive trench filling.

Claim 7 (previously amended): The trench capacitor according to claim 20, wherein said barrier layer is formed of a material selected from the group consisting of silicon oxide, silicon nitride, oxynitride, tungsten nitride, titanium nitride, and tantalum nitride.

8 (original): The trench capacitor according to claim 5, wherein said barrier layer is formed of a material selected from the group consisting of silicon oxide, silicon nitride, oxynitride, tungsten nitride, titanium nitride, and tantalum nitride.

9 (original): The trench capacitor according to claim 1, including a vertical transistor disposed in said trench.

10 (original): A method of producing a trench capacitor, the method which comprises:

introducing a buried well into a substrate;

forming a trench in the substrate, the trench having an upper region and a lower region;

forming an insulation collar in the upper region;

providing a capacitor dielectric by forming a dielectric layer of tungsten oxide lining the lower region; and

filling the trench with a conductive trench filling for providing an inner capacitor electrode.

11 (original): The method according to claim 10, which comprises forming the dielectric layer by oxidizing a tungsten-containing layer.

12 (original): The method according to claim 11, which comprises forming the tungsten-containing layer from a material selected from the group consisting of tungsten nitride, tungsten silicide, and pure tungsten.

13 (original): The method according to claim 10, which comprises forming the dielectric layer by oxidizing a tungsten-containing layer at a temperature between 200°C and 600°C in an atmosphere containing at least one element selected from the group consisting of O₃, H₂O, N₂O, and NO.

14 (original): The method according to claim 10, which comprises forming the dielectric layer by a reactive sputtering of tungsten in an oxygen-containing atmosphere.

15 (original): The method according to claim 10, which comprises forming the dielectric layer as a layer with a dielectric constant greater than 50.

16 (original): The method according to claim 10, which comprises subjecting the dielectric layer to a thermal treatment at a temperature between 550°C and 1100°C for

providing the dielectric layer with a dielectric constant greater than 50.

17 (original): The method according to claim 10, which comprises forming the conductive trench filling from a tungsten-containing material.

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18 (original): The method according to claim 10, which comprises forming a tungsten-containing layer by carrying out a selective chemical vapor deposition process at a temperature between 200°C and 400°C and using tungsten hexafluoride as a starting material.

19 (original): The method according to claim 10, which comprises:

forming a tungsten-containing layer from a material selected from the group consisting of tungsten nitride, tungsten silicide, and pure tungsten; and

producing the dielectric layer from the tungsten-containing layer.

20 (currently amended): A trench capacitor, comprising:

a substrate formed with a trench;

said trench having an upper region and a lower region and a conductive trench filling formed of tungsten-containing material disposed in said upper and lower regions of said trench;

an insulation collar formed in said upper region and having an upper end;

a buried well formed in said substrate, said lower region at least partly extending through said buried well;

a dielectric layer formed of tungsten oxide material lining said lower and upper regions and having an upper end, said dielectric layer serving as a capacitor dielectric;

a barrier layer disposed between said dielectric layer and said substrate and having an upper end, said barrier layer disposed in said upper and lower regions; and

an insulation layer disposed between on a top surface of said dielectric layer, ~~said barrier layer, and said insulation collar, said insulation layer and~~ extending from said upper end of said barrier layer to said upper end of said insulation collar and said dielectric layer.

21 (previously presented): The trench capacitor according to claim 20, wherein said barrier layer is formed of a metal nitride material.

22 (previously presented): The trench capacitor according to claim 20, wherein each of said conductive trench filling, said dielectric layer, and said insulating layer has a top surface, said trench capacitor including a conductive buried bridge portion covering at least a portion of each said top surface of said conductive trench filling, said dielectric layer, and said insulating layer and connecting to a doped region of a transistor.

23 (new): The trench capacitor according to claim 1, wherein said conductive trench filling is formed, at least in said lower region of said trench, entirely of a material selected from the group consisting of tungsten-nitride, tungsten-silicide, and pure tungsten.

24 (new): The trench capacitor according to claim 20, wherein said conductive trench filling is formed, at least in said lower region of said trench, entirely of a material selected from the group consisting of tungsten-nitride, tungsten-silicide, and pure tungsten.